

WHAT IS CLAIMED IS:

1. A system verification method to be applied by an intellectual property user for verifying operation of an integrated system design constructed with modules
5 designed in-house and at least one module protected as intellectual property of an outside entity, said verification method comprising:
 - providing design data or a verification model of each of the modules;
 - simulating the operation of the integrated system with one of the input vector sequences so as to obtain a respective output vector sequence, which includes
10 the steps of:
 - dividing a simulation time period into a finite number of time steps in sequence from time 0 to time n;
 - supplying an input vector for said each of the modules at one time step, while observing an internal state of said each module at the respective time step;
 - 15 computing an output vector from said each in-house designed module and the internal state at a starting time of a time step subsequent to the time step, based on the design data or the verification model;
 - transmitting an input vector for said each module of the outside entity to the outside entity at said one time step through a communication line such that the
20 entity simulates operation of said each module with the input vector at said one time step so as to compute an output vector;
 - receiving the output vector from the outside entity at a beginning of the subsequent time step;
 - integrating the output vectors from all modules at the subsequent time
25 step to obtain an output of the whole system at the subsequent time step; and

repeating the supplying, computing, transmitting, receiving and integrating steps from time 0 to time n sequentially to obtain an output sequence of the whole system.

- 5 2. A system verification equipment to be applied by an intellectual property user for verifying operation of an integrated system design constructed with modules designed in-house and at least one module protected as intellectual property of an outside entity, said equipment comprising:

storage medium for storing design data or a verification model of each of
10 the modules;

simulating means for simulating the operation of the integrated system with one of the input vector sequences so as to obtain a respective output vector sequence, which includes:

dividing means for dividing a simulation time period into a finite number
15 of time steps in sequence from time 0 to time n;

supplying means for supplying an input vector for said each of the modules at one time step, while observing an internal state of said each module at the respective time step;

computing means for computing an output vector from said each
20 in-house designed module and the internal state at a starting time of a time step subsequent to the time step, based on the design data or the verification model;

transmitting means for transmitting an input vector for said each module of the outside entity to the outside entity at said one time step through a communication line such that the entity simulates operation of said each module with
25 the input vector at said one time step so as to compute an output vector;

receiving means for receiving the output vector from the outside entity at a beginning of the subsequent time step;

integrating means for integrating the output vectors from all modules at the subsequent time step to obtain an output of the whole system at the subsequent
5 time step; and

repeating means for controlling the supplying, computing, transmitting, receiving and integrating means to repeat from time 0 to time n sequentially to obtain an output sequence of the whole system.

10 3. The system design verification equipment according to claim 2, further comprising fabricating means for fabricating at least one integrated circuit according to the verified integrated system design.

4. The system verification equipment according to claim 2, wherein said
15 communication line includes at least one of an exchange communication line, the Internet, and a leased line.

5. The system verification equipment to be operated by an intellectual property user as recited in claim 2, wherein the input vector is encrypted before being
20 transmitted across the communication then decrypted data after being received over the communication line.

6. The system verification equipment to be operated by an intellectual property user as recited in any of claim 2, wherein the integrated circuit design is
25 constructed on one single integrated circuit chip.

7. A system verification equipment to be applied by an intellectual property provider for verifying operation of at least one module protected as intellectual property and included in an integrated system design in conjunction with modules

5 designed in-house by an integrated system designer, said equipment comprising:

storage medium for storing design data or a verification model of said module;

receiving means for receiving an input vector sequence from the integrated system designer at one time step through a communication line;

10 simulating means for simulating the operation of the module with the input vector sequence so as to obtain a respective output vector sequence; and

sending means for sending the output vector sequence to the integrated system designer at a beginning of the subsequent time step,

15 wherein, said time step and the subsequent time step are defined and supplied by the integrated system designer.

8. The system verification equipment according to claim 7, wherein said simulating means is provided by running a module simulation software on a general-purpose computer.

20 9. The system verification equipment according to claim 7, wherein at least one previously developed module is used in said system design.

10. The system verification equipment according to claim 7, further comprising a user authentication means for identifying a sender of the input vector sequence.
- 5 11. The system verification equipment according to claim 11, wherein said user authentication mechanism accepts only the input vector sequence transmitted from a user who has registered with the equipment.
12. The system verification equipment according to claim 11, wherein said
10 user authentication mechanism further identifies the method of simulating module operation changes applied by the integrated system designer according to the result of identification.
13. The system verification equipment according to claim 7, further
15 including a detecting means for detecting said input vector sequence any illegal use of or modification to the module that contravenes design intention of the module.
14. The system verification equipment according to claim 14, wherein, upon
detecting the input vector sequence that contravenes the design intention of the
20 module, the user authentication mechanism notifies the sender of the input vector sequence that the input vector sequence is invalid.
15. The system verification equipment according to claim 7, further comprising an analyzing means for recording and monitoring the input vector

sequence for each said module thereby quantitatively analyzing how often the module has been used and determining specification of module to be provided later.

16. The system verification equipment according to claim 7, further
5 comprising a service charge means for determining for each said integrated system designer by quantity of load on the simulating means for outputting the output vector.

17. The system verification equipment according to claim 17, wherein the
10 service charge for each said integrated system designer is determined according to quantity of input vector data transmitted to the equipment.

18. The system verification equipment according to claim 7, wherein, as said
communication line includes at least one of an exchange communication line, the
15 Internet, and a leased line.

19. The system verification equipment according to claim 7, further
comprising an encrypting/decrypting means for decrypting the input vector before
the simulating then encrypting the output vector before sending over the
20 communication line.

20. The system verification equipment according to claim 7, wherein a third
party that is other than the intellectual property provider of the module applies said
system verification equipment.